Abnormalities Produced in the Nervous System of the Chick Embryo.

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Contribution from the Zoölogical Laboratory, Kansas State Agricultural College (abstract).

Abnormalities were produced in the nervous system of the chick embryo by incubating the eggs under different degrees of heat. Some of the eggs were kept in low temperatures ranging from 94°-101° F. Others were incubated at 104°-108° F. Different periods of time were used with all the temperatures, varying from twenty-two to seventy-two hours.

The most noticeable abnormality found in embryos subjected to temperatures below normal for twenty-four hours, was the lack of folding in of the neural plates for some distance above and below the primitive knot region. The neural folds in the anterior end of the embryo were generally formed, and these folds extended posteriorly as far as the first somite. Below this point until the primitive node region was reached the flattened neural plate only was developed. At this place the folds appeared again. Not only was the tube formed here, but also extra thickenings of the walls of the tube, and numerous cells, apparently of ectodermal origin, nearly filled the central canal. In some specimens the tube was closed entirely, and in others the excessive tissue filled the canal in such a way that two or three neural openings were present in it. This condition was found more frequently in the forty-eight and seventy-two hour chicks than in those incubated for a shorter length of time.

Another abnormality produced at low temperatures was the curved primitive streak. This was seen in the early stages of development. In these instances the neural folds turned off to the left side of the embryo and formed a curved tube.

A third condition produced was the formation of one neural plate into a neural fold before the other had begun to develop. This lack of development of the neural fold appeared more often in the younger specimens than in the older, because the other neural plate finally formed after a longer period of incubation.

Embryos produced under excessive heat developed different types of deformities than those formed at low temperatures. A large per cent of the abnormalities appeared in the head region. A constriction of the neural tube below the optic vesicles occurred frequently. The optic vesicles and midbrain developed much more rapidly than that part of the brain between them, until a very small neck connected the two.

The effect of high temperatures upon the somites was the reverse of that caused by low temperatures. Nearly four per cent of the embryos incubated at 104°-108° F. developed extra somites lateral to the ordinary somites, while in those embryos produced below 101° F. the number of somites was diminished, or did not form at all in some of the twenty-four hour chicks.

In those eggs incubated at 94°-101° F., sixty-seven per cent were abnormal. Seventeen per cent of these abnormalities were in the brain region. Eighty-three per cent were in the neural tube.

Temperatures between 104° and 108° F. produced ninety per cent abnormal embryos. Forty-six per cent of these were in the head, and fifty-four per cent were in the neural tube.

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The Origin of Cyclones.

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I have long been endeavoring to collect facts applicable to a theory I have had about storms, *popularly* called cyclones, but *technically* tornadoes, such as passed northwest of Topeka, Tuesday evening, June 5, 1917; and, I believe what I then observed is in confirmation of this theory.

Take a stream at flood, where the rapidly-moving main current is passing a body of comparatively still water in a pocket in the bank, and where the side of this current is in contact with the pocket, a series of rapidly-moving whirlpools is formed, moving from left to right at the right bank of the stream, and from right to left at the left bank of the stream.

Precisely the same is constantly in progress, but less violently in the normal current of streams, and are there called eddies, and might well be compared with the little harmless whirlwinds most frequently occurring in autumn.

Apply to this known fact the principle that liquids, vapors and gasses are similarly subject to much the same laws of motion, and you see I have a deduction rather than a theory; but, as exact science altogether rejects theories and very cautiously accepts deductions, we must find instances in proof.

Now, take the storm referred to. A heavy local rain passed due north over Topeka, accompanied with a gale at the time this damage was done, the rain ceasing about 5:40 p. m., and the sky clearing quickly showed another rain cloud at close range northwest of Topeka, moving apparently in a northeasterly direction, accompanied with vivid lightning and heavy thunder.

The two storms, or currents, had evidently come in contact, and the pressure thus created constituted sufficient resistance to make "whirlpools" between the surfaces of contact.

The velocity and volume of the air current, and whether passing through comparatively still atmosphere or encountering another current and its direction, volume and velocity will determine whether there will be "eddies" or "whirlpools" or cyclones.

The following facts may be offered in further proof:

1. The progressive direction of a cyclone is comparable with the edge of the storm cloud.

2. The direction of rotation of the "twister" conforms with the direction of the whirlpools at the edges of the current of a stream.